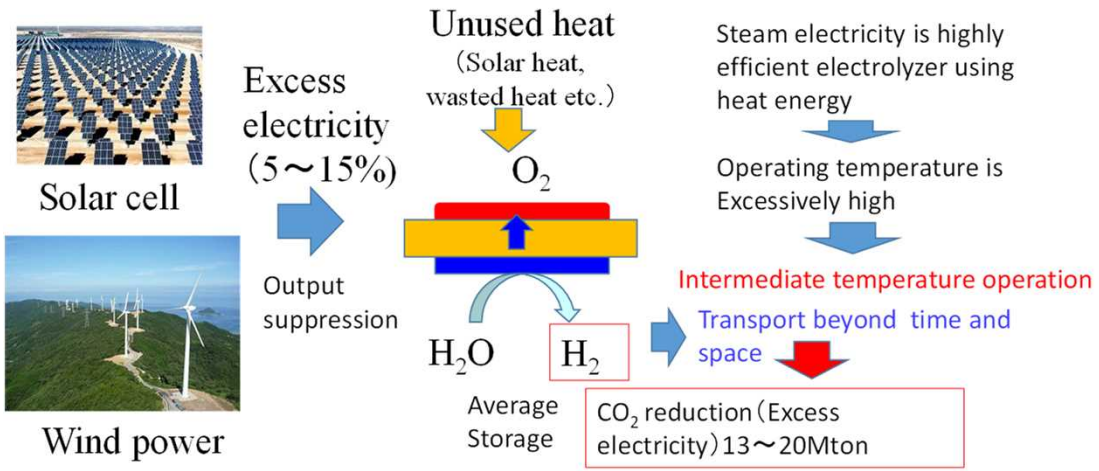
Project Name: International Joint Research on Efficient Intermediate Temperature Solid Oxide Electrolysis Cell (2020–2023)

Entrusted party: Kyushu University

Outline of the project

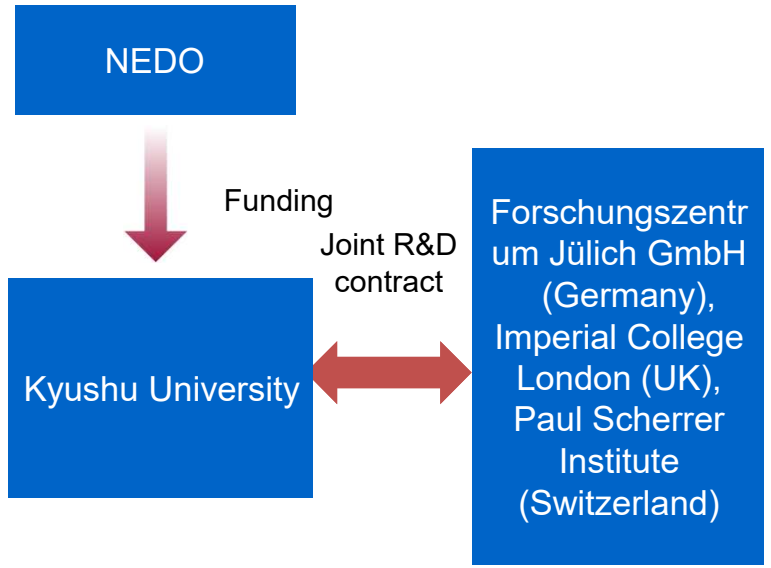
Hydrogen, like electricity, is expected to be a clean energy carrier, and its uses are expected to grow into areas such as fuel cell vehicles. Widespread use of hydrogen can decrease CO_2 emissions. However, at present, hydrogen is produced from fossil fuels like CH_4. Storage of renewable energy is required to level its fluctuation since it has low energy density. In this study, we will develop intermediate temperature solid oxide electrolysis cells to effectively convert excess renewable power to hydrogen for storage, and aim to get an electrolysis efficiency level higher than 85% at an operating temperature of 500 °C.



Significance of international R&D

In order to develop a highly efficient solid oxide ion and an oxide proton conducting electrolyzer, joint research will be performed under collaboration with Forschungszentrum Jülich to make a thin film electrolyte by a wet process, and with Imperial College London for developing an active air electrode, and the Paul Scherrer institute for preparing the interface structure control electrode. Through this joint research, it will be expected that device development will be accelerated, and cell performance can be significantly improved.

Project scheme



Expected outcomes

- Hydrogen production and storage using renewable energy, such as solar cells
- Production of low-cost hydrogen
- Expected economic effect:
  Assuming that the surplus power of renewable energy is 55 billion kWh (22% of the generated power), the amount of hydrogen that can be produced with a hydrogen production efficiency of 70% is 12 x 10^9 Nm^3.
  Price of hydrogen: 20 yen/Nm^3 (mass consumption)
  Economic scale: 24 billion yen
- Estimated reduction effects of CO_2 emission (13-20 x 10^6 ton-CO_2/year)